EARTH OBSERVATION SYMPOSIUM (B1)
Future Earth Observation Systems (2)

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LONG TERM MEASUREMENT OF THE EARTH'S RADIATION BUDGET USING A CONSTELLATION OF BROADBAND RADIOMETERS HOSTED ON IRIDIUM NEXT

Abstract

A unique opportunity exists to host a set of Earth Radiation Budget (ERB) sensors on the Iridium NEXT (NEXT) LEO constellation in a cost effective manner to address WMO's recommendations. The NEXT constellation, with 66 interconnected satellites provides a unique platform for hosting Earth observation missions. Launches are planned to begin in 2014.

The ERB both drives and responds to global climate and monitoring it can provide much insight into the climate system and how it might be changing. A climate quality measurement of the ERB requires high absolute accuracy and excellent stability and a long-term (decades) data record in order to inform the debate about global warming. Measurement of the ERB in terms of the broadband reflected solar (0.3 to 4 m) and emitted thermal (4 to 200 m) components have been identified as high priority by the WMO for climate observations.

High temporal resolution is the key advantage offered by the NEXT platform and can provide a great step forward in accurately monitoring the energy balance of the planet. The proposed sensors consist of twelve broad band instruments and associated imager for scene identification and cloud classification. By placing two such sensors in each of six NEXT orbital planes can improve the product refresh time from currently 12 hours to 3 hours. The increased temporal resolution will allow direct measurement of the changes to the broadband radiances from rapidly varying components of the climate such as cloud and aerosol, lessening the need for narrow band sensors to infer such changes. As the prediction of cloud response to climate change is still a major source of uncertainty; improved measurement of the cloud effect and any variations are of particular interest.

• Proposed twelve ERB sensors solution on NEXT has been analyzed in a detailed study demonstrating real-time data delivery, full globe coverage with a swath of 1000 km and resolution of 10 km at nadir and 3 hourly temporal resolutions even at the equator at low cost. Additionally: • As the NEXT orbits are not sun-synchronous, aliasing effects from a single sensor in sun-synchronous orbits, are no longer of concern • Twelve sensors with frequent near-coincidences at high latitudes make cross-calibration a normal part of the system operation. Cross-calibration will also be possible against current sensors such as CERES and GERB. • System robustness and continuity is assured since loss of a sensor or satellite is not mission critical.